Fig. 1

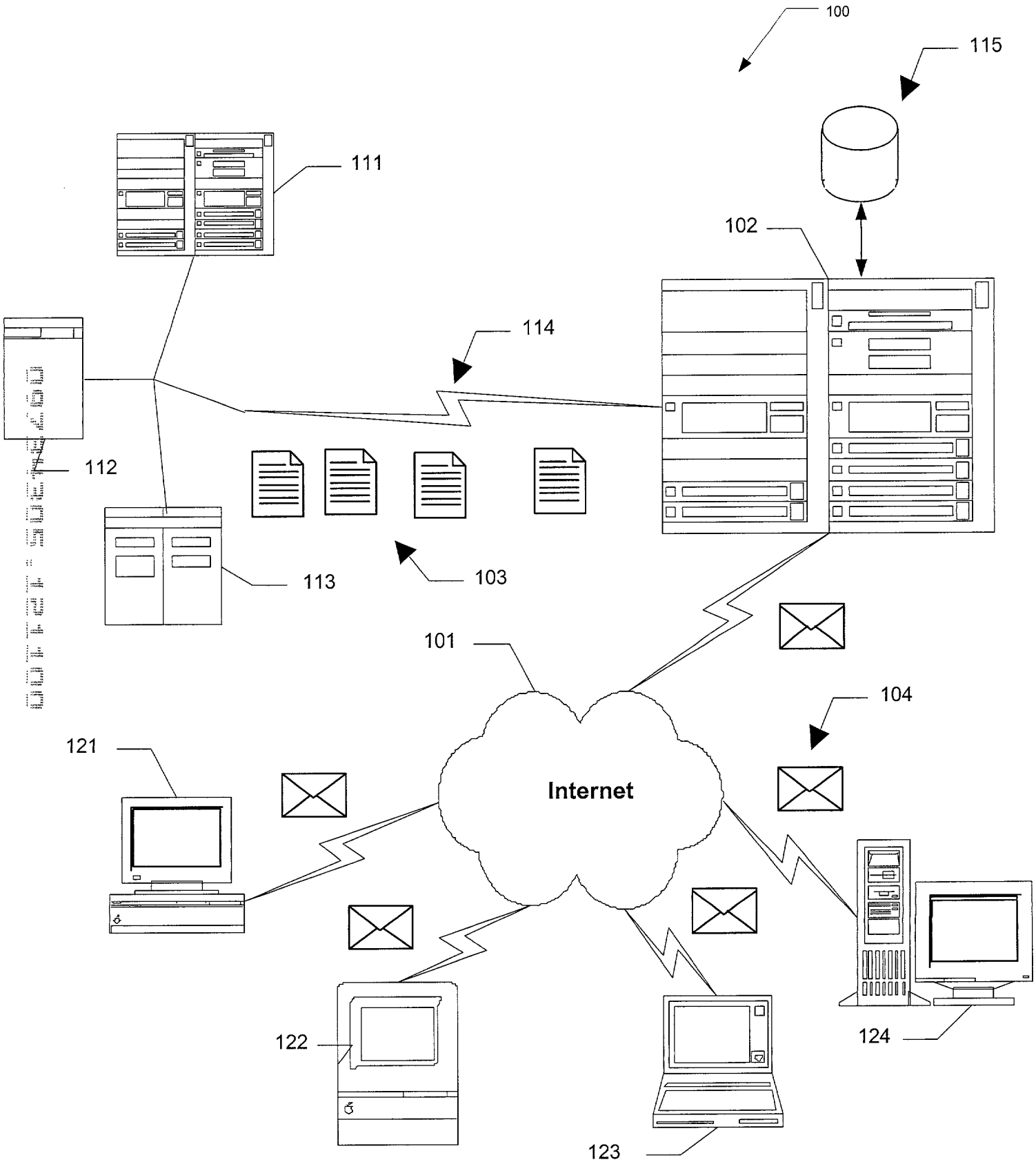

100
115
111
102
114
112
113
103
101
104
121
Internet
122
123
124

FIG. 2

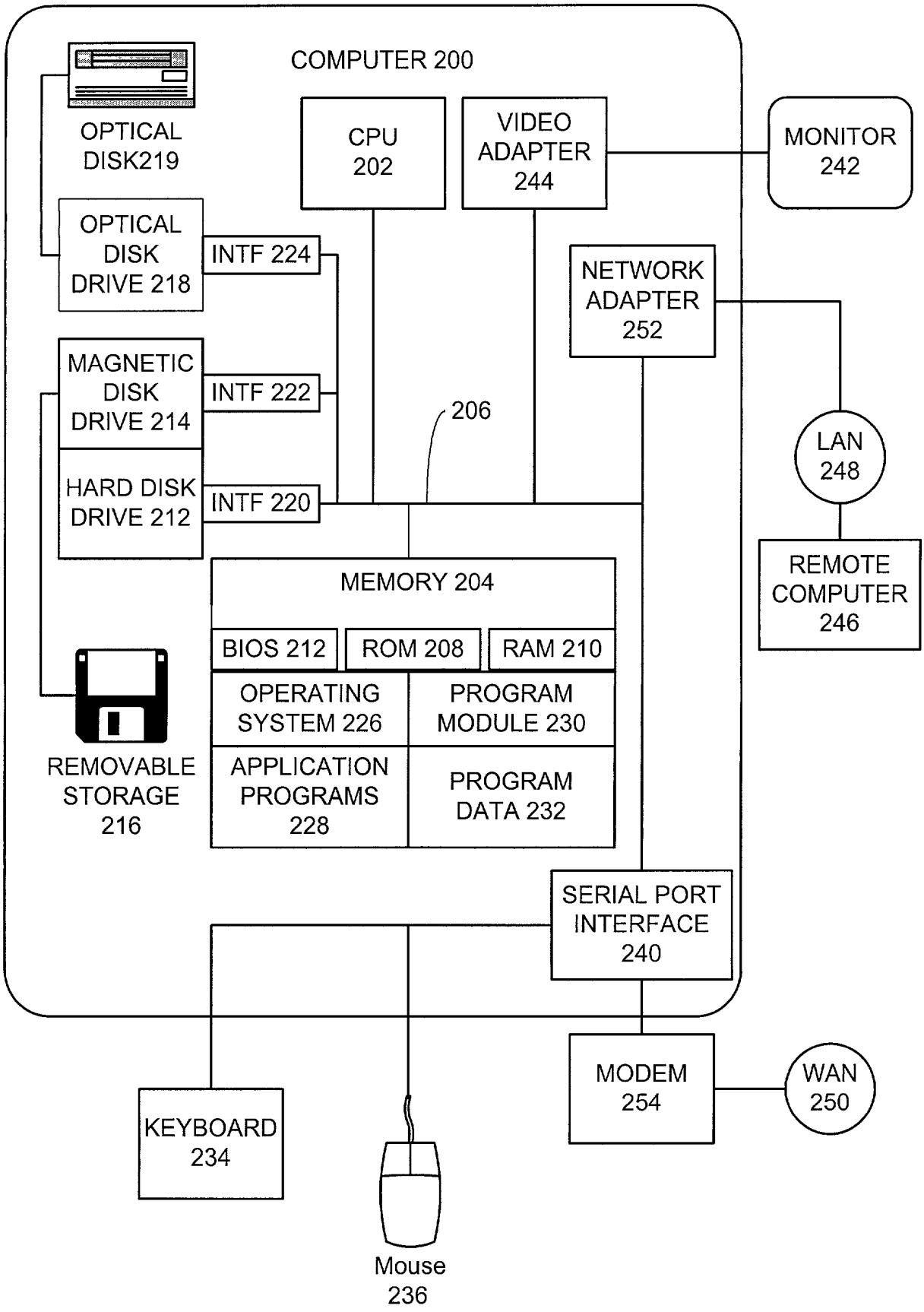

COMPUTER 200
OPTICAL DISK219
CPU 202
VIDEO ADAPTER 244
MONITOR 242
OPTICAL DISK DRIVE 218
INTF 224
NETWORK ADAPTER 252
MAGNETIC DISK DRIVE 214
INTF 222
206
LAN 248
HARD DISK DRIVE 212
INTF 220
REMOTE COMPUTER 246
MEMORY 204
BIOS 212
ROM 208
RAM 210
OPERATING SYSTEM 226
PROGRAM MODULE 230
REMOVABLE STORAGE 216
APPLICATION PROGRAMS 228
PROGRAM DATA 232
SERIAL PORT INTERFACE 240
MODEM 254
WAN 250
KEYBOARD 234
Mouse 236

Fig. 3

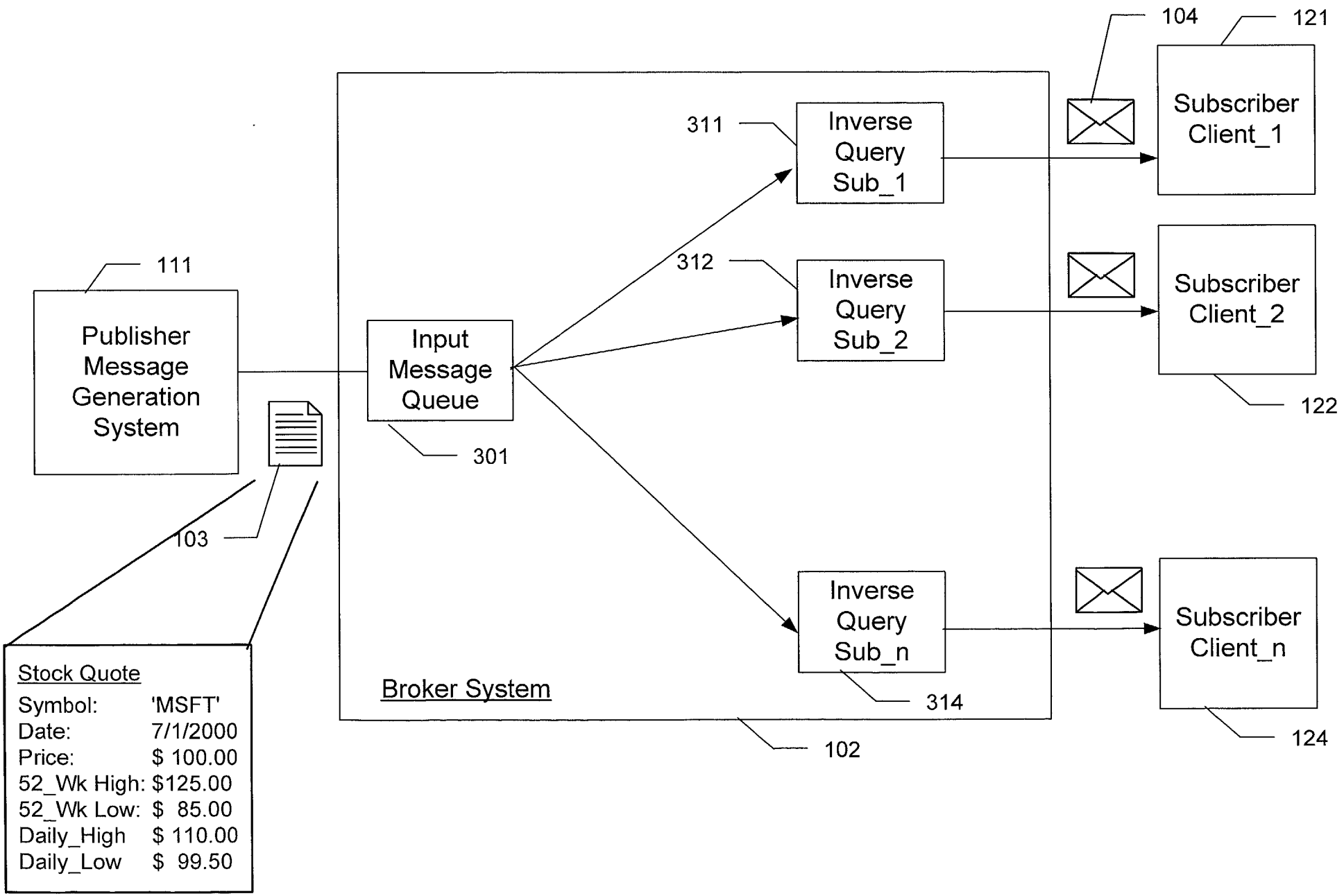

104
121
Subscriber Client_1
311
Inverse Query Sub_1
312
Inverse Query Sub_2
Subscriber Client_2
122
111
Publisher Message Generation System
Input Message Queue
301
103
Inverse Query Sub_n
Subscriber Client_n
314
124
Broker System
102
Stock Quote
Symbol: 'MSFT'
Date: 7/1/2000
Price: $ 100.00
52_Wk High: $125.00
52_Wk Low: $ 85.00
Daily_High $ 110.00
Daily_Low $ 99.50

Fig. 4

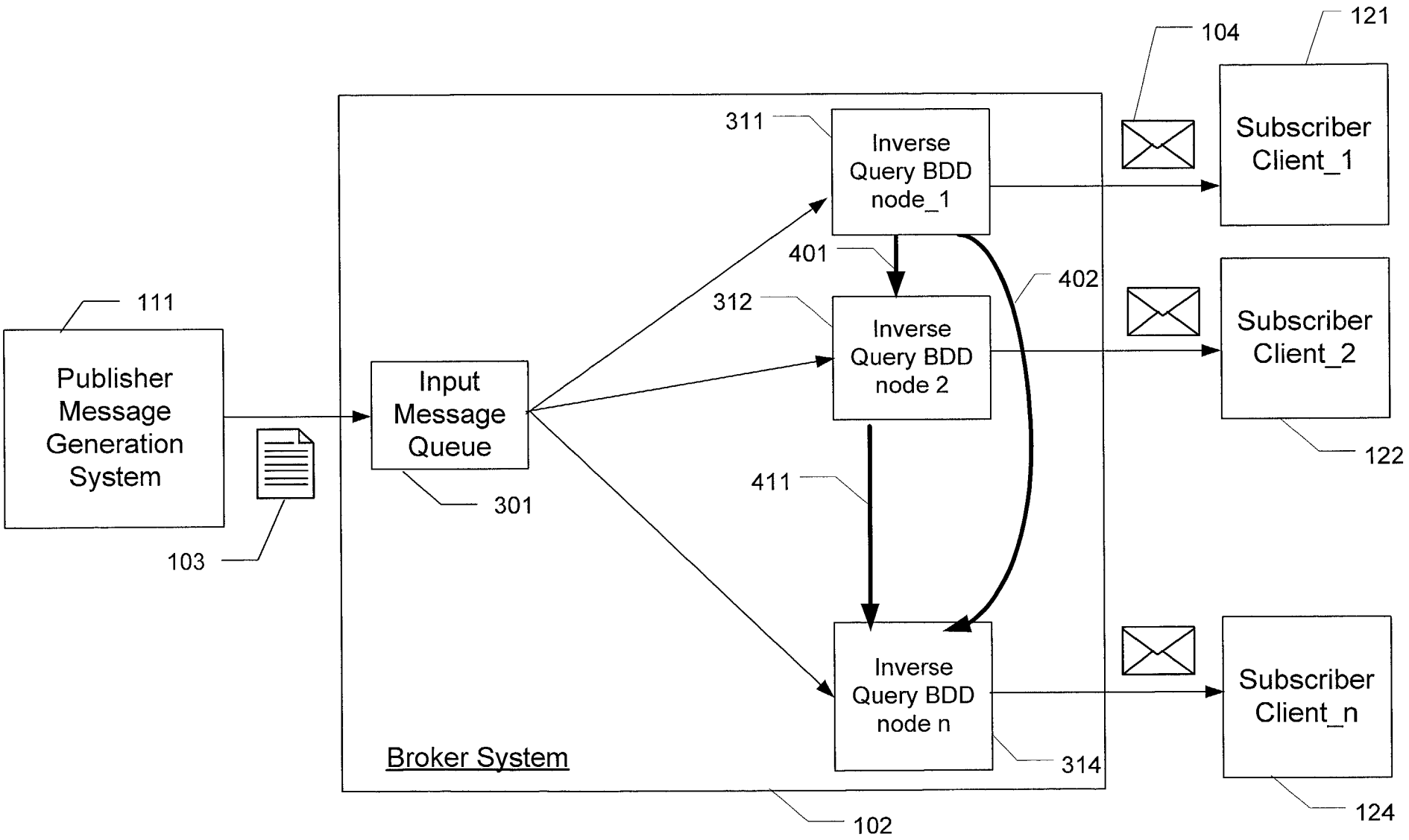

104
121
Subscriber Client_1
311
Inverse Query BDD node_1
401
402
111
312
Inverse Query BDD node 2
Subscriber Client_2
Publisher Message Generation System
Input Message Queue
122
411
301
103
Inverse Query BDD node n
Subscriber Client_n
Broker System
314
124
102

Fig. 5

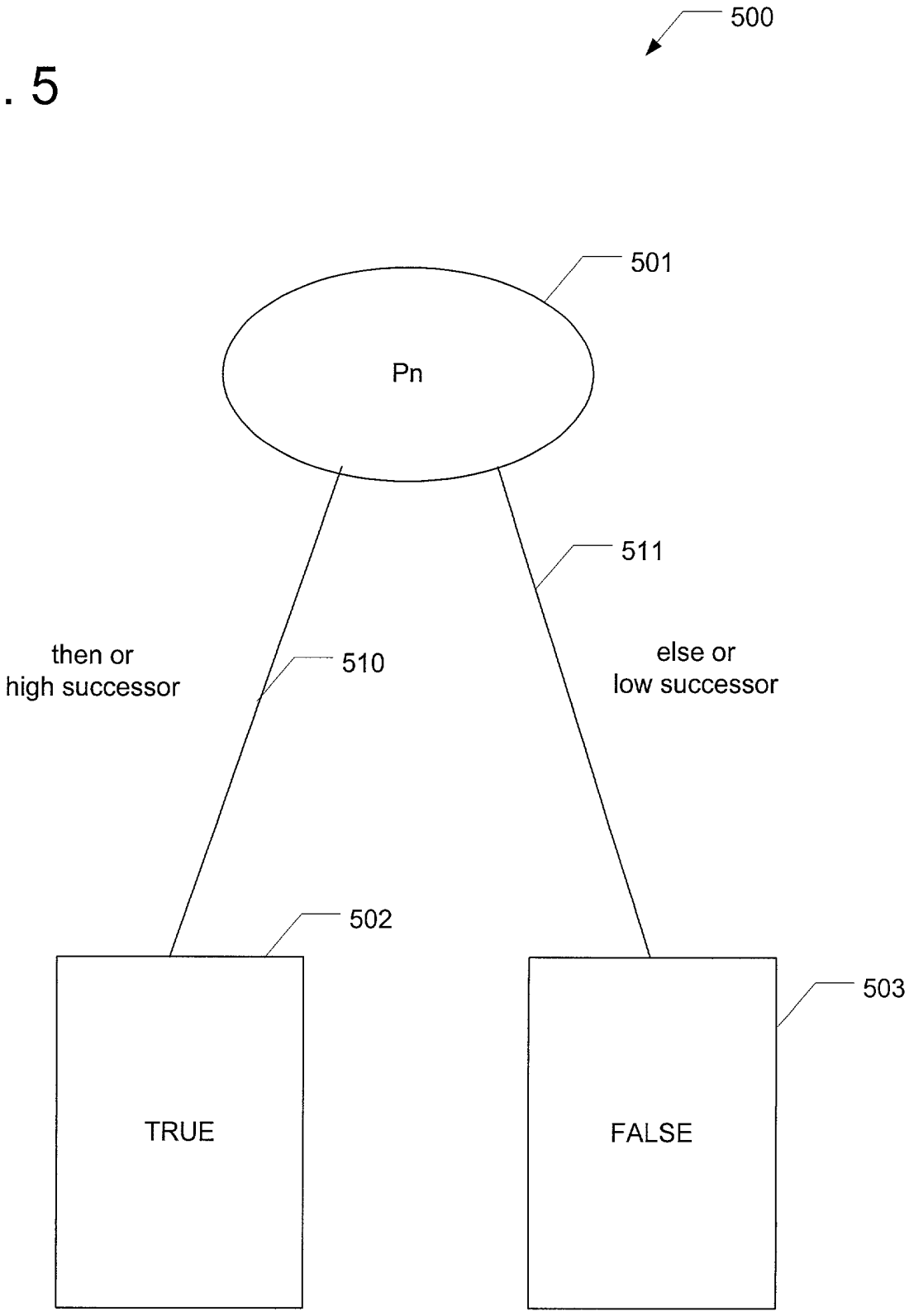

500
501
Pn
511
then or
high successor
510
else or
low successor
502
503
TRUE
FALSE

Fig. 6

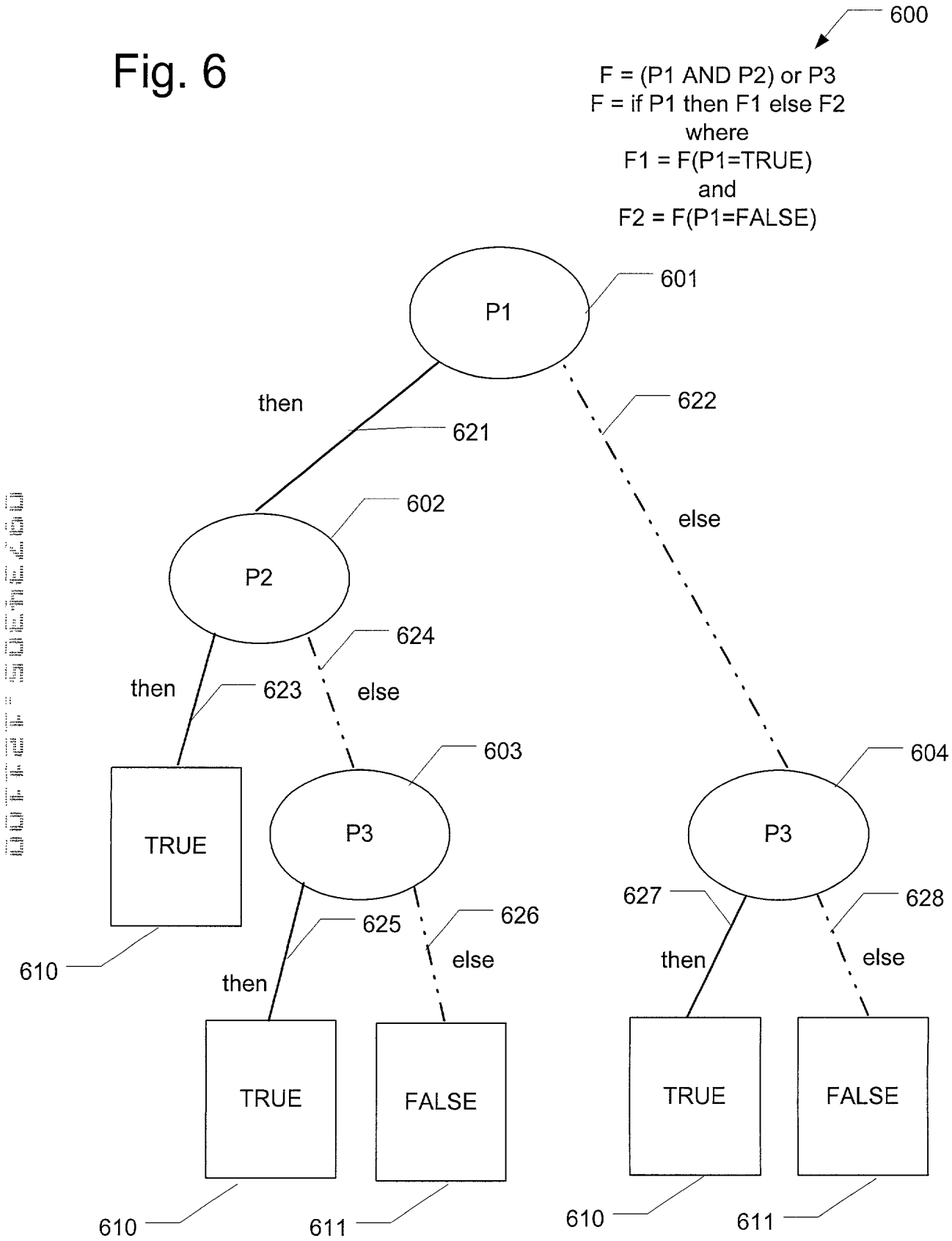

600
F = (P1 AND P2) or P3
F = if P1 then F1 else F2
where
F1 = F(P1=TRUE)
and
F2 = F(P1=FALSE)
P1
601
then
621
622
else
P2
602
624
then
623
else
TRUE
P3
603
P3
604
627
628
625
626
else
then
else
then
TRUE
FALSE
TRUE
FALSE
610
610
611
610
611

Fig. 7

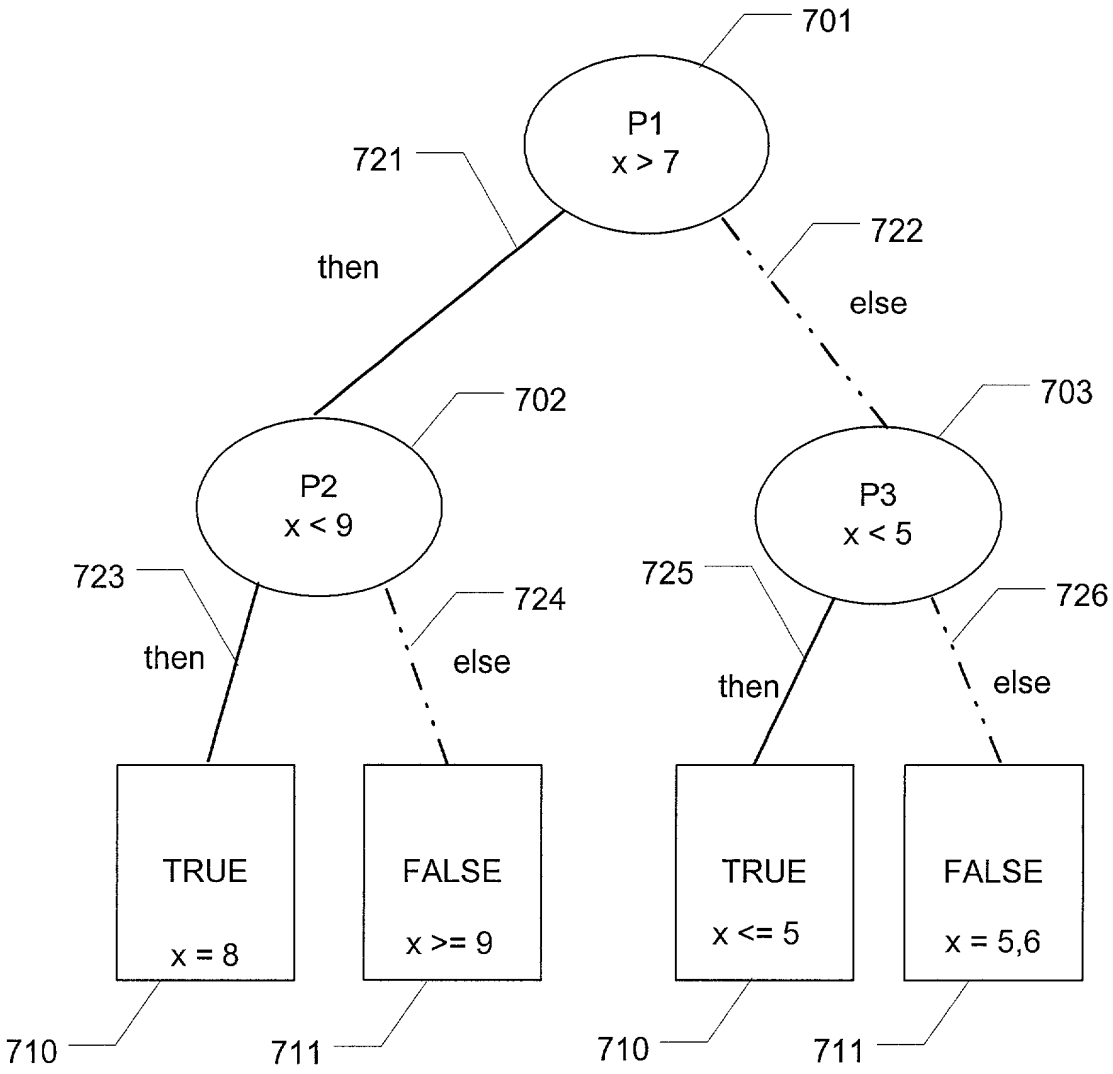

701
P1
x > 7
721
then
722
else
702
703
P2
x < 9
P3
x < 5
723
then
724
else
725
then
726
else
TRUE
x = 8
FALSE
x >= 9
TRUE
x <= 5
FALSE
x = 5,6
710
711
710
711

Fig. 8

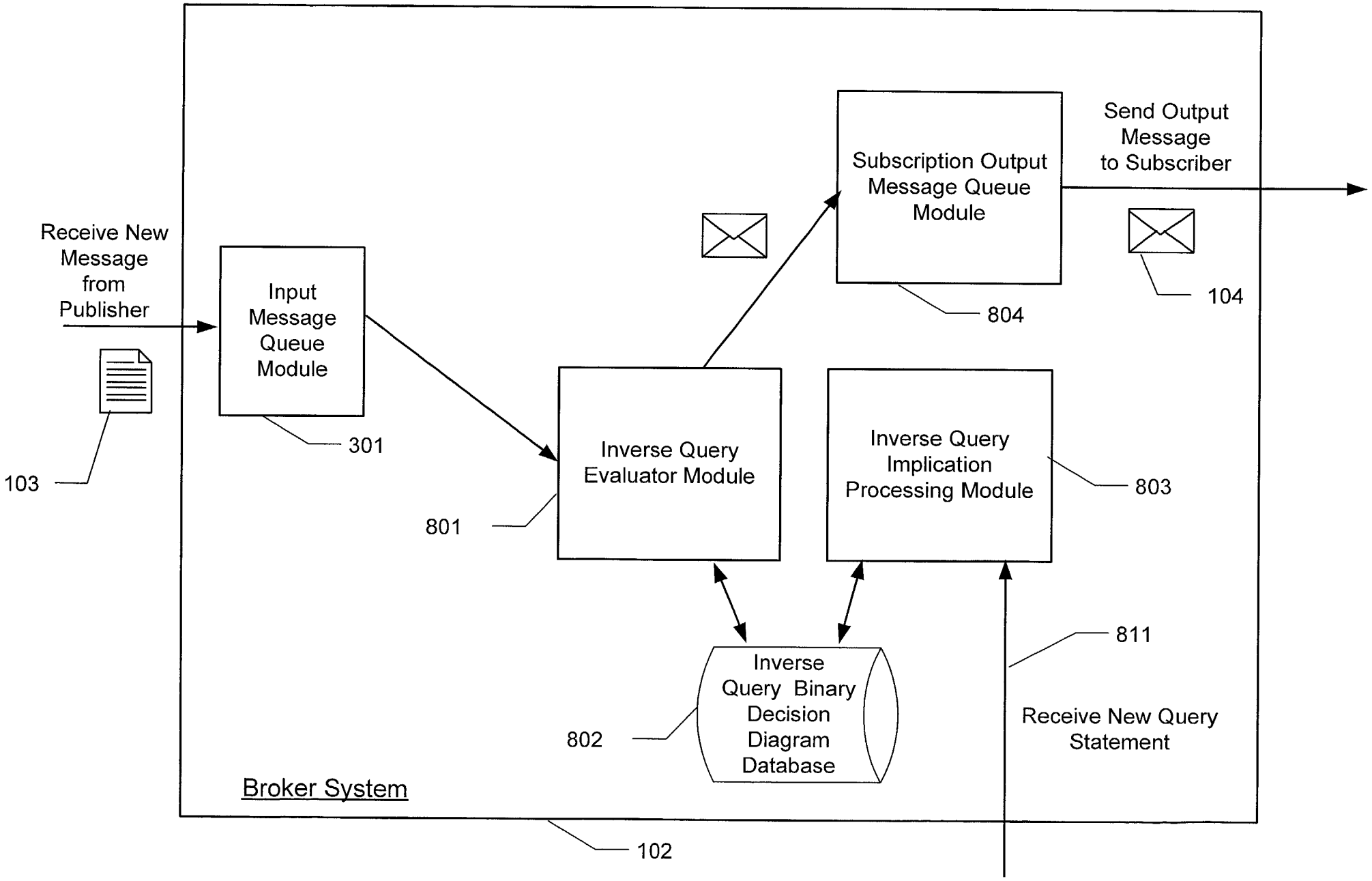

Receive New Message from Publisher
103
Input Message Queue Module
301
Inverse Query Evaluator Module
801
Subscription Output Message Queue Module
804
Send Output Message to Subscriber
104
Inverse Query Implication Processing Module
803
Inverse Query Binary Decision Diagram Database
802
811
Receive New Query Statement
Broker System
102

Fig. 9

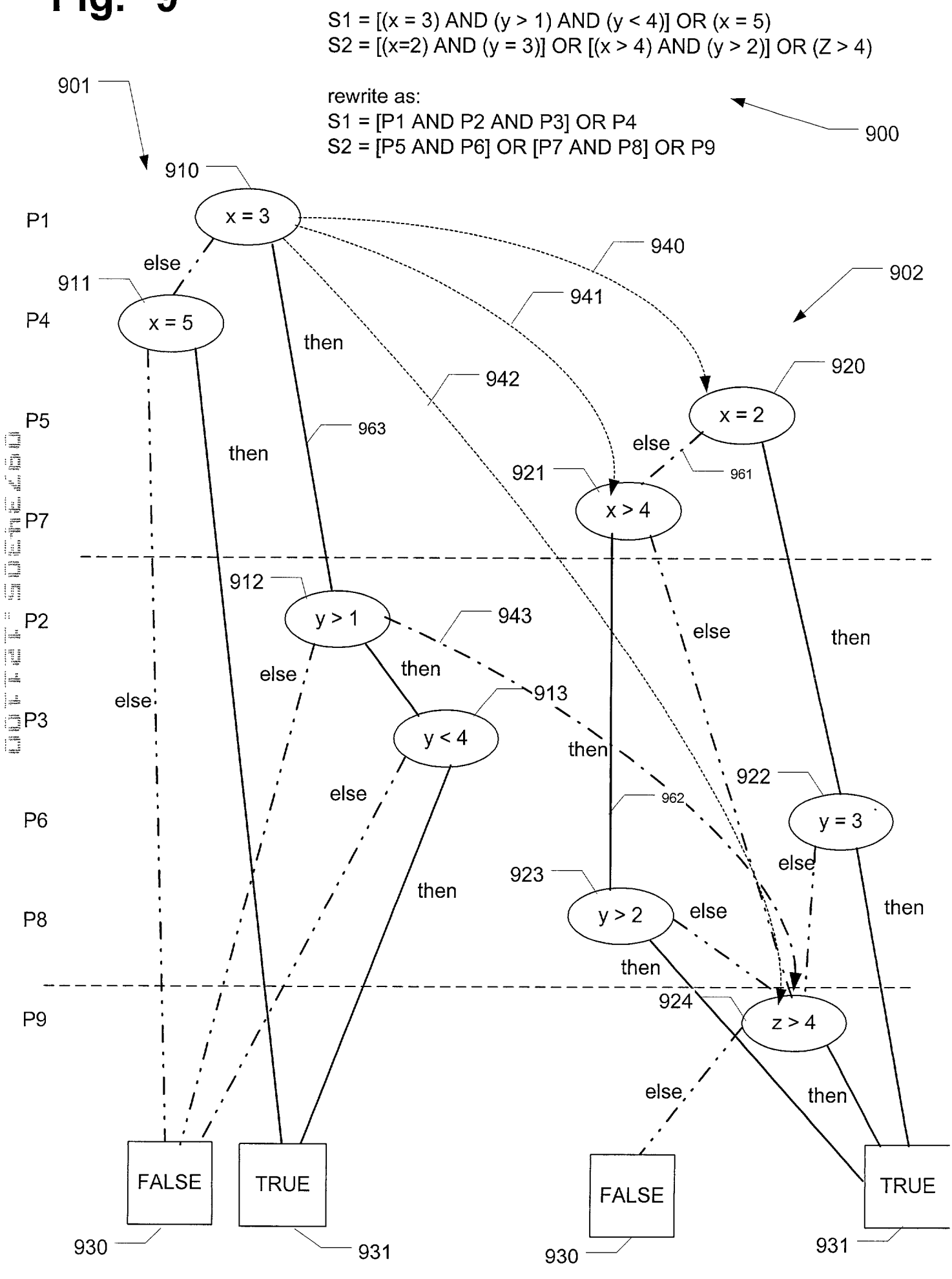

S1 = [(x = 3) AND (y > 1) AND (y < 4)] OR (x = 5)
S2 = [(x=2) AND (y = 3)] OR [(x > 4) AND (y > 2)] OR (Z > 4)
rewrite as:
S1 = [P1 AND P2 AND P3] OR P4
S2 = [P5 AND P6] OR [P7 AND P8] OR P9
900
901
902
910
x = 3
911
x = 5
912
y > 1
913
y < 4
920
x = 2
921
x > 4
922
y = 3
923
y > 2
924
z > 4
930
FALSE
931
TRUE
940
941
942
943
961
962
963
P1
P2
P3
P4
P5
P6
P7
P8
P9
then
else

Fig. 10

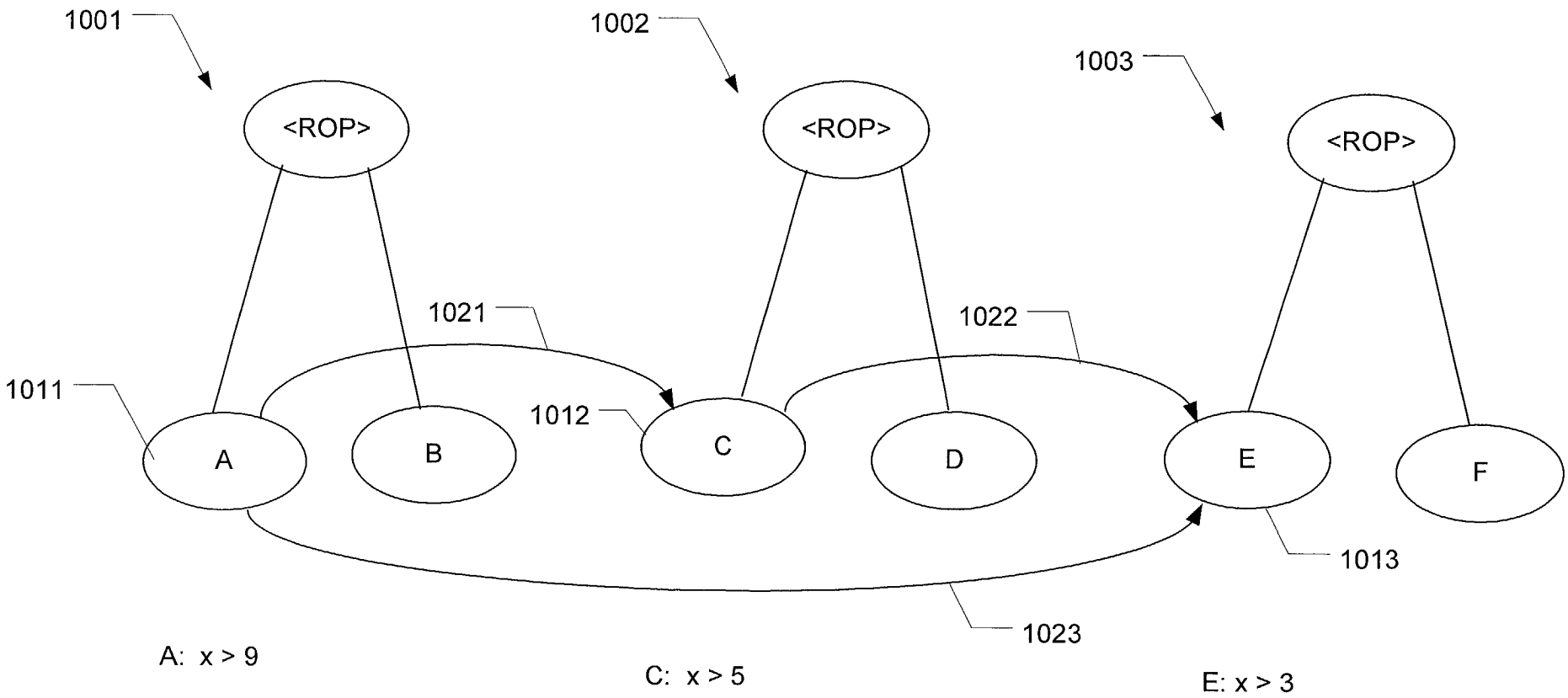

1001
1002
1003
<ROP>
<ROP>
<ROP>
1021
1022
1011
1012
A
B
C
D
E
F
1013
1023
A: x > 9
C: x > 5
E: x > 3

FIG. 11

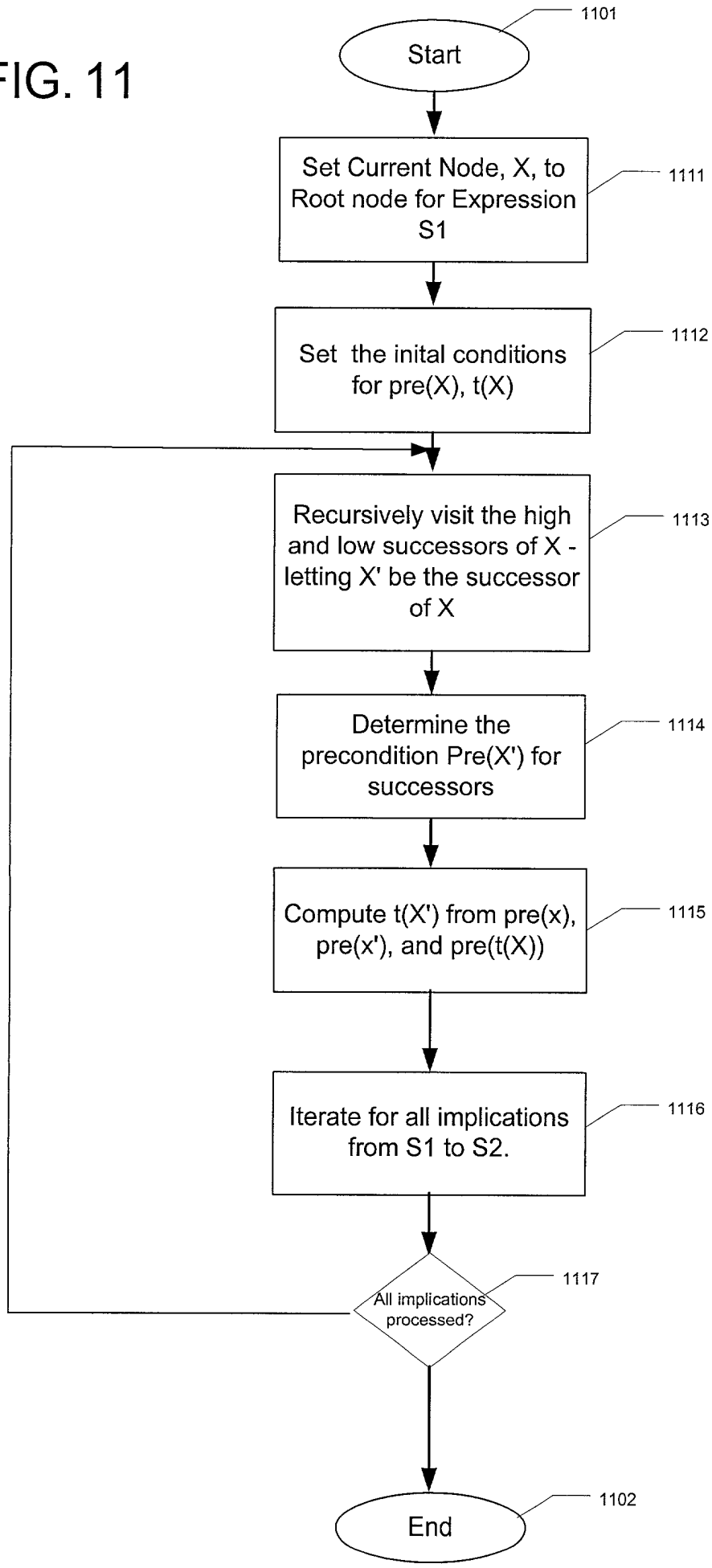

Start
1101
Set Current Node, X, to Root node for Expression S1
1111
Set the inital conditions for pre(X), t(X)
1112
Recursively visit the high and low successors of X - letting X' be the successor of X
1113
Determine the precondition Pre(X') for successors
1114
Compute t(X') from pre(x), pre(x'), and pre(t(X))
1115
Iterate for all implications from S1 to S2.
1116
All implications processed?
1117
End
1102

FIG. 12

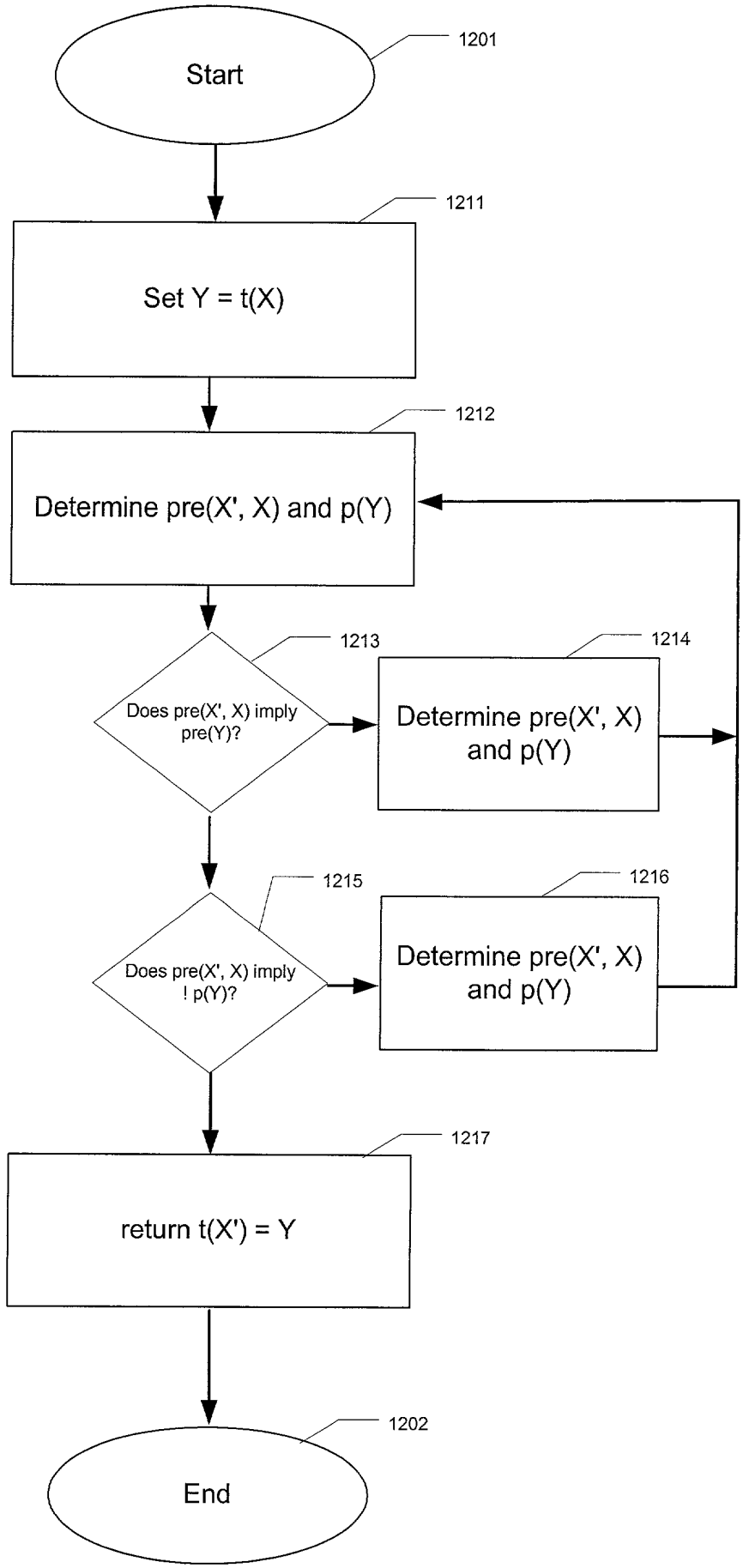
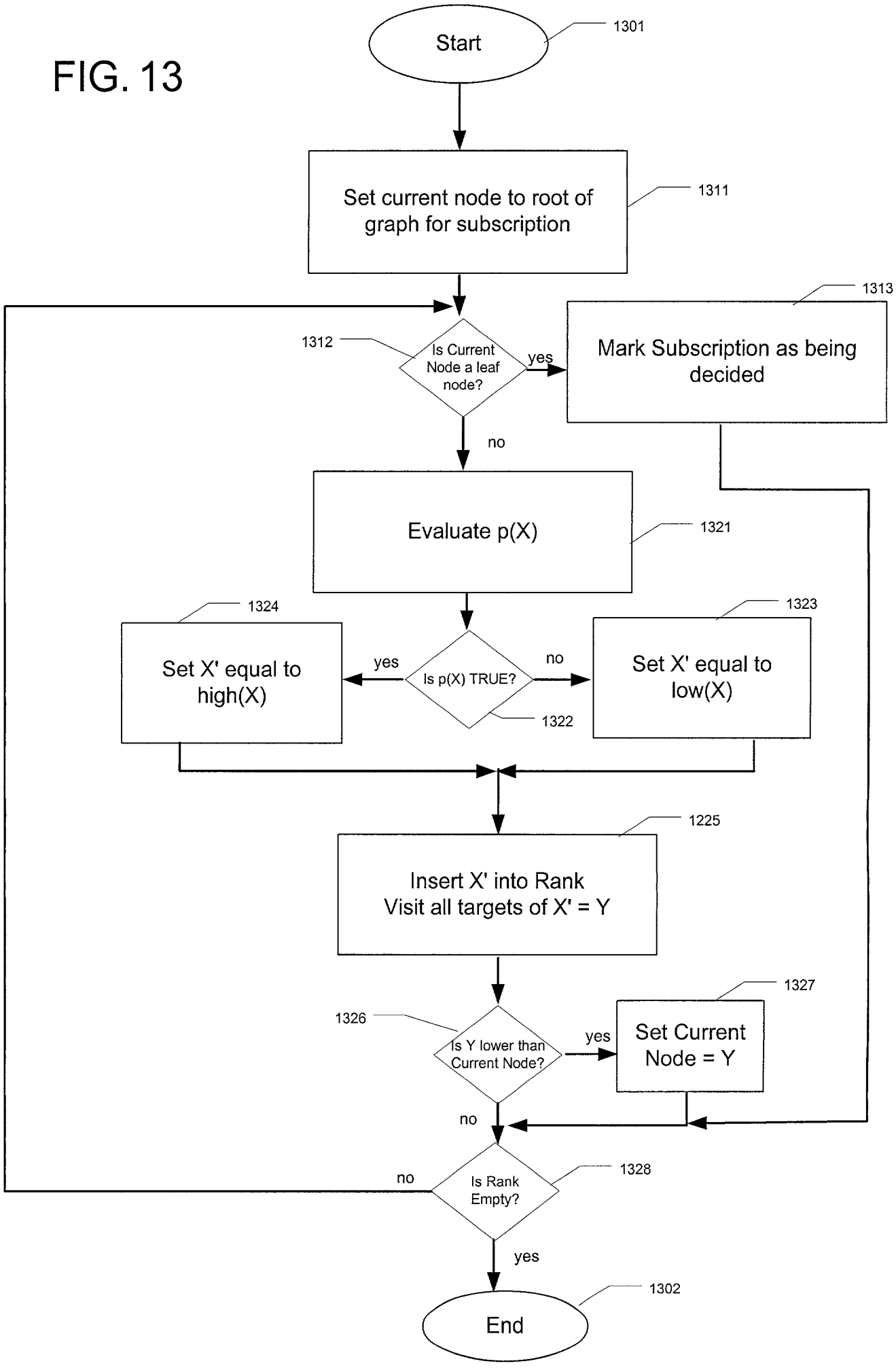

Start
1201
Set Y = t(X)
1211
Determine pre(X', X) and p(Y)
1212
Does pre(X', X) imply pre(Y)?
1213
Determine pre(X', X) and p(Y)
1214
Does pre(X', X) imply ! p(Y)?
1215
Determine pre(X', X) and p(Y)
1216
return t(X') = Y
1217
End
1202

FIG. 13


Start
1301
Set current node to root of graph for subscription
1311
1313
1312
Is Current Node a leaf node?
yes
Mark Subscription as being decided
no
Evaluate p(X)
1321
1324
1323
Set X' equal to high(X)
yes
Is p(X) TRUE?
no
Set X' equal to low(X)
1322
1225
Insert X' into Rank
Visit all targets of X' = Y
1327
1326
Is Y lower than Current Node?
yes
Set Current Node = Y
no
no
Is Rank Empty?
1328
yes
1302
End